

# Thermally Conductive Tape Based on Carbon Nanotube Array, Phase II

Completed Technology Project (2009 - 2011)



## Project Introduction

Future NASA missions require thermal control systems that can accommodate large changes in ambient temperature. The two essential aspects of an effective thermal interface material (TIM) are high compliance and high thermal conductivity.

## Anticipated Benefits

Thermal management is a critical aspect of various high power devices for future NASA missions. The energy generated by electronic devices dissipates into the ambient environment through heat sinks or heat spreaders. Effective heat conduction requires good thermal contact between heat sinks and electronic packages. Thermal contact resistance arises from the microscopic lack of planarity and micro-roughness of the mating surfaces. When two surfaces are brought into contact, the actual contact area is usually much smaller than the apparent contact area, resulting in a thermal barrier at the interface. The problem becomes even more severe in vacuum and low temperature environments. Therefore, high thermal conductivity and vacuum compatible thermal interface materials are crucial to thermal control of electronic devices in space applications. The proposed thermal interface technology is believed to be applicable to many uses in thermal management. It may be used at the interface between electronic devices and heat spreaders, to attach thermometry, heaters, etc. Being electrically conductive to some extent, it could also be used to form electrical connections. Further, it could be used to quickly attach items without the use of adhesives and to attach items in locations that might otherwise be difficult or impossible to achieve. Avoiding adhesives also eliminates the outgassing of various vapors over time.



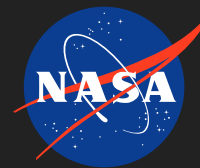
Thermally Conductive Tape  
Based on Carbon Nanotube  
Array, Phase II

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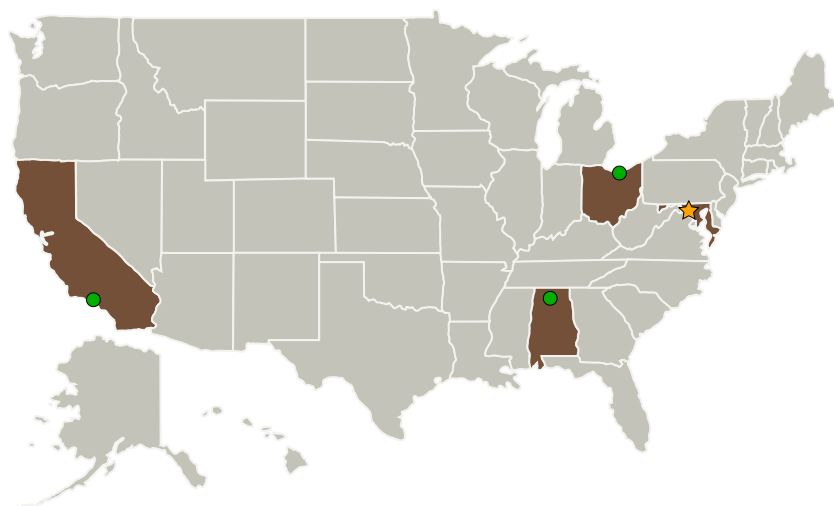
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Atlas Scientific	Supporting Organization	Industry	San Jose, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Goddard Space Flight Center (GSFC)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Project Manager:

Gary C Jahns

### Principal Investigator:

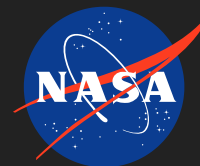
James Maddocks

## Primary U.S. Work Locations

Alabama	California
Maryland	Ohio

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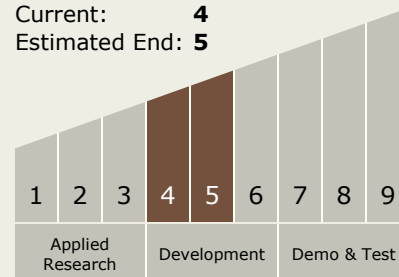
## Project Transitions

 **February 2009:** Project Start

 **October 2011:** Closed out

## Technology Maturity (TRL)

Start: **4**  
Current: **4**  
Estimated End: **5**



## Technology Areas

### Primary:

- TX14 Thermal Management Systems
  - └ TX14.2 Thermal Control Components and Systems
    - └ TX14.2.3 Heat Rejection and Storage